

**REMARKS**

Claims 1-14 are currently pending in the application, with claims 5, 6, and 12-14 being previously withdrawn from consideration by the Examiner. By this response, claims 1 and 8 are amended for the Examiner's consideration. The above amendments do not add new matter to the application and are fully supported by the original disclosure. For example, support for the amendments is provided in the claims as originally filed, and at least at paragraph 0025 of the specification as filed. Reconsideration of the rejected claims in view of the above amendments and the following remarks is respectfully requested.

***Complete Action not Provided***

Applicants respectfully submit that the Examiner did not provide a complete action, and as such, Applicants submit that the next action can not be a final action. The Examiner is reminded of the guidance provided by 37 C.F.R. § 1.104(a)(1) regarding the Nature of Examination (emphasis added):

On taking up an application for examination . . . the examiner shall make a thorough study thereof and shall make a thorough investigation of the available prior art relating to the subject matter of the claimed invention. The examination shall be complete with respect to both compliance of the application . . . with the applicable statutes and rules and to the patentability of the invention as claimed, as well as with respect to matters of form, unless otherwise indicated.

Applicants submit that the Examiner did not address at least independent claims 1 and 7 as claimed. More specifically, in rejecting claims 1 and 7 under 35 U.S.C. §101, Applicants submit that the Examiner did not address the language of claims 1 and 7 as amended in the response filed on April 19, 2007. That is, in the response filed on April 19, 2007, claims 1 and 7 were amended to recite "controlling the nozzles." This feature was not addressed in the

Examiner's §101 rejection. Moreover, in the explanation of the §101 rejection, the Examiner refers to language of claims 1 and 7 that was deleted in the amendment dated April 19, 2007.

Thus, the Examiner is clearly not treating the invention as claimed.

Additionally, the Examiner is reminded of the guidance provided by MPEP §707.07(f) (emphasis added):

In order to provide a complete application file history and to enhance the clarity of the prosecution history record, an examiner must provide clear explanations of all actions taken by the examiner during the prosecution of an application.

...  
Where the applicant traverses any rejection, the examiner should, if he or she repeats the rejection, take note of the applicant's argument and answer the substance of it.

Applicants submit that the §102 rejection of claims 1-4 and 7-11 does not include a clear explanation of the rejection. Instead, as discussed in greater detail below, the Examiner merely "cut and paste" SCHUTTE'S abstract into the Office Action. This, however, does not constitute a clear explanation of the §102 rejection of claims 1-4 and 7-11. Thus, Applicants submit that the Examiner did not provide clear explanations of all actions taken by the examiner during the prosecution of an application, as is mandated by the MPEP.

For these reasons, Applicants submit that a clear issue was not developed between the Examiner and Applicants. As such, Applicants submit that the next Office Action cannot properly be made final because a clear issue has not been developed between the Examiner and Applicants. More specifically, according to MPEP §706,

Before final rejection is in order a clear issue should be developed between the examiner and applicant. To bring the prosecution to as speedy conclusion as possible and at the same time to deal justly by both the applicant and the public, the invention as disclosed and claimed should be thoroughly searched in the first action and the references fully

applied; and in reply to this action the applicant should amend with a view to avoiding all the grounds of rejection and objection.

Additionally, MPEP §706.07(a) notes:

Under present practice, second or any subsequent actions on the merits shall be final, except where the examiner introduces a new ground of rejection that is neither necessitated by applicant's amendment of the claims nor based on information submitted in an information disclosure statement filed during the period set forth in 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17(p). ...

Furthermore, a second or any subsequent action on the merits in any application ... will not be made final if it includes a rejection, on newly cited art, other than information submitted in an information disclosure statement filed under 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17 (p), of any claim not amended by applicant or patent owner in spite of the fact that other claims may have been amended to require newly cited art.

Accordingly, Applicants respectfully submit that the Examiner may not properly make the next action final, as in the previous Office Action a “clear issue [was not] developed between the examiner and applicant”.

### ***35 U.S.C. §112 Rejection***

Claims 1-4 and 8-11 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. More specifically, the Examiner asserts that use of the term “should” in claims 1 and 8 renders the claims indefinite. This rejection is respectfully traversed.

Although Applicants do not agree with the rejection and submit that the claims are clear and definite when read in light of the specification and with the knowledge of one having ordinary skill in the art, nevertheless, to advance prosecution, claims 1 and 8 have been amended

to address the Examiner's concerns. Particularly, claim 1 has been amended to recite *the nozzle control vector meets a minimization criterion*, and claim 8 has been amended to recite *the nozzle control vector satisfies the minimization criterion*. As such, the term "should" no longer appears in the claims, and both claims positively recite that the nozzle control vector meets (satisfies) the minimization criterion.

Accordingly, Applicants respectfully request that the §112, second paragraph, rejection of claims 1-4 and 8-11 be withdrawn.

### ***35 U.S.C. §101 Rejection***

Claims 1-4 and 7-11 are rejected under 35 U.S.C. §101 as being directed to non-statutory subject matter. The Examiner maintains the same rejection from the previous Office Action, explaining that the claims still recite only a series of mathematical matrix operations. This rejection is respectfully traversed.

In Applicants' previous response dated April 19, 2007, independent claims 1 and 7 were amended to positively recite controlling the nozzles. More specifically, independent claim 1 recites "*A method for controlling nozzles ... and controlling the nozzles.*" Also, independent claim 7 recites "*A computer control method for controlling nozzles ... and controlling the nozzles.*" Thus the independent claims positively recite controlling the nozzles, which is clearly more than a series of mathematical matrix operations, as asserted by the Examiner.

Moreover, the Examiner's rejection does not even address the language of the claims as amended as of April 19, 2007. That is, in the explanation of the rejection at pages 3-4 of the outstanding Office Action, the Examiner quotes language of the preamble of claim 7 that was deleted in the amendment dated April 19, 2007. More specifically, the Examiner contends that

the preamble of claim 7 recites a computer control method to obtain an optimum fuel control of nozzles (outstanding Office Action, page 3, last paragraph). However, claim 7 as amended on April 19, 2007, recites “A computer control method for controlling nozzles....” The language “to obtain” referenced by the Examiner was omitted and replaced with the language “for controlling based upon an.” Even further, the current rejection does not address, or even allude to, the recited feature of “controlling the nozzles.” Thus, as the Examiner’s most recent rejection does not address the actual language of the claims, it appears the Examiner did not even consider the amendment to the claims that was submitted on April 19, 2007.

In any event, Applicants submit that the claims are directed to statutory subject matter. The claims are directed to a method, which clearly falls within one of the four enumerated categories of patentable subject matter recited in 35 U.S.C. §101 (*i.e.*, process, machine, manufacture, or composition of matter). Moreover, although the claims admittedly recite mathematical operations, the claims also positively recite controlling the nozzles, which is more than a 35 USC §101 judicial exception (*i.e.*, an abstract idea, natural phenomenon, or law of nature).

Accordingly, Applicants respectfully request that the §101 rejection of claims 1-4 and 7-11 be withdrawn.

### ***35 U.S.C. §102 Rejection***

Claims 1-4 and 7-11 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,208,915 issued to Schütte et al. (“SCHUTTE”). This rejection is respectfully traversed.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). See MPEP §2131. Applicants submit that SCHUTTE does not disclose each and every feature of the claimed invention.

Applicants initially note that the entirety of the explanation of §102 rejection consists only of SCHUTTE'S abstract, copied verbatim. The Examiner has made no attempt whatsoever to explain which elements/passages of SCHUTTE read on the various recited features of the claimed invention. Thus, the rejection is improper on its face, and should be withdrawn for at least this reason alone. In any event, Applicants submit that SCHUTTE does not disclose the claimed invention for the following reasons.

The present invention relates to a method for controlling nozzles based upon the computer-assisted determination of an optimum-fuel control of the nozzles. Such a method can be used in particular for controlling the nozzles of a spacecraft, such as, e.g., a satellite, a space probe, a space station or the like. More specifically, independent claim 1 recite, in pertinent part:

- ... computer generating a defined matrix transformation of starting constraints for a mass flow of the nozzles and of the minimization criterion;
- data processing a representation of a geometric description of the matrix transformation of starting constraints ;
- searching, with a computer-assisted geometric search procedure in vector space, limiting point sets of the geometric description of the starting constraints;
- applying the matrix transformation of minimization criterion to the points of the limiting point sets; and
- controlling the nozzles.

Also, independent claim 7 recites, in pertinent part:

... generating a defined matrix transformation of starting constraints for a mass flow of the nozzles and of the minimization criterion;

data processing a representation of a geometric description of the matrix transformation of starting constraints;

searching, with a geometric search procedure in vector space, limiting point sets of the geometric description of the starting constraints;

applying the matrix transformation of minimization criterion to the points of the limiting point sets; and

controlling the nozzles.

SCHUTTE does not disclose these features of the claimed invention. More specifically, SCHUTTE does not disclose, and the Examiner has not positively identified any information arguably related to: *data processing a representation of a geometric description of the matrix transformation of starting constraints; searching, with a computer-assisted geometric search procedure in vector space, limiting point sets of the geometric description of the starting constraints; or, applying the matrix transformation of minimization criterion to the points of the limiting point sets*, as recited in the claimed invention.

Instead, SCHUTTE discloses a modified application of the known simplex algorithm. It is known that the simplex algorithm provides a highly accurate thruster control solution, but has the disadvantage of requiring too much computation time (col. 2, lines 1-5). While it is also known a look up table method provides a simpler and quicker solution than the simplex algorithm, the solution provided by the look up table method is not as accurate as that of the simplex algorithm (col. 2, lines 16-30). With this in mind, SCHUTTE discloses the dual simplex algorithm, which is a combination of both the known simplex algorithm and the look up table method, and in which some data for the simplex algorithm is pre-processed ahead of time and stored in a look up table. This pre-processed data is then used in a simplex algorithm computation. Since some of the data necessary for running the simplex algorithm computation is

pre-processed, it reduces the computation time of the simplex algorithm computation. More specifically, SCHUTTE states at lines 58-67 of col. 3:

... the dual simplex algorithm is realized in that all data necessary for processing the dual simplex algorithm, which can be computed off-line (ahead of time), are first determined, are stored in data fields in the computer memory and are called up with suitable addresses from the computer memory to be used for computing with the simplex algorithm during the on-line operation, wherein only a reduced simplex table, in which only the thruster selection identification number and the associated vector for the control values (b) are listed, is used.

Applicants are keenly aware of SCHUTTE, as evidenced by the discussion of it counterpart application EP 0 977 687 B1 at paragraph 0004 of the instant specification. In contrast to SCHUTTE, however, Applicants' invention avoids using the simplex method (Applicants' specification, paragraph 0009). That is, instead of SCHUTTE'S iterative simplex approach, the claimed invention utilizes a geometric approach realized in a computer-assisted manner. Through a defined matrix transformation, a geometric description of the problem is possible that permits a geometric location of an optimum-fuel solution. Such a method can be much quicker than a solution of the problem via customary simplex methods (e.g., SCHUTTE).

More specifically, claims 1 and 7 each recite *data processing a representation of a geometric description of the matrix transformation of starting constraints*. SCHUTTE makes no mention whatsoever of a representation of a geometric description of the matrix transformation of starting constraints. Nor has the Examiner identified any such disclosure in SCHUTTE.

Additionally, claim 1 recites *searching, with a computer-assisted geometric search procedure in vector space, limiting point sets of the geometric description of the starting constraints*; and claim 7 recites *searching, with a geometric search procedure in vector space, limiting point sets of the geometric description of the starting constraints*. SCHUTTE makes no



mention whatsoever of searching limiting set points of the geometric description. Nor has the Examiner identified any such disclosure in SCHUTTE. In fact, SCHUTTE makes no mention of searching anything, much less of a geometric search procedure in vector space, as recited in claims 1 and 7.

Therefore, Applicants submit SCHUTTE fails to disclose at least the above-noted features of independent claims 1 and 7, and cannot arguably be said to anticipate the claimed invention. Claims 2-4 and 8-11 depend from an allowable independent claim, and are allowable based upon the allowability of the respective independent claims. Moreover, SCHUTTE does not disclose many of the features additionally recited in the dependent claims.

For example, SCHUTTE does not disclose *calculating, within a scope of a use of the matrix transformation of the minimization criterion, scalar products of a vector representation of points of the limiting point set and the vector*  $\mathbf{v}_d^T := \left[ \sum_{j=1}^n A_{0j1} \sum_{j=1}^n A_{0j2} \cdots \sum_{j=1}^n A_{0jp} \right]$ ,  $p := n - m$ , as recited in claims 2 and 9. To the contrary, SCHUTTE does not even disclose a vector representation of points of a limiting point set, much less the recited vector. Nor has the Examiner identified any such disclosure in SCHUTTE.

Moreover, SCHUTTE does not disclose: *converting the matrix transformation of the starting constraints for the mass flow of the nozzles in a computer-assisted manner into allowable multi-dimensional value regions; forming, to determine the limiting point sets, at least one multi-dimensional cut set of individual allowable multi-dimensional value regions; and determining the limiting point sets as those point sets that limit the at least one cut set, as recited in claim 3; or, repeatedly projecting the allowable multi-dimensional value regions of the dimension  $p$  on a dimension  $p-1$ , until a projection of the allowable value regions on limiting intervals of a dimension  $p=1$  has been achieved; and subsequently searching, with a computer-*

*assisted search procedure, a determination of limiting point sets as a cut set of limiting intervals, as recited in claim 4. Furthermore, SCHUTTE does not disclose: converting the matrix transformation of the starting constraints for the mass flow of the nozzles into allowable multi-dimensional value regions; forming, to determine the limiting point sets, at least one multi-dimensional cut set of individual allowable multi-dimensional value regions; and determining the limiting point sets as those point sets that limit the at least one cut set, as recited in claim 10; or, repeatedly projecting the allowable multi-dimensional value regions of the dimension  $p$  on a dimension  $p-1$ , until a projection of the allowable value regions on limiting intervals of a dimension  $p=1$  has been achieved; and subsequently searching a determination of limiting point sets as a cut set of limiting intervals, as recited in claim 11. Nor has the Examiner identified any such disclosure in SCHUTTE.*

Accordingly, Applicants respectfully request that the §102 rejection of claims 1-4 and 7-11 be withdrawn.

**CONCLUSION**

In view of the foregoing amendments and remarks, Applicants submit that all of the claims are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue. The Examiner is invited to contact the undersigned at the telephone number listed below, if needed. Applicants hereby make a written conditional petition for extension of time, if required. Please charge any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 19-0089.

Respectfully submitted,  
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